DOCUMENT RESUME

ED 288 510 IR 012 907

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TITLE Simulations and the Curriculum.
PUB DATE [85]
NOTE 14p.
PUB TYPE Guides - Non-Classroom Use (055) -- Tests/Evaluation Instruments (160)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS Computer Assisted Instruction; *Computer Simulation; *Computer Software; *Curriculum Enrichment; *Evaluation Criteria; *Microcomputers; Objectives; Teacher Developed Materials

ABSTRACT

Microcomputers can be used with simulation software to provide students both with experience in the "real world" of decision making and feedback on the decisions made. Such software allows individual students to choose the roles they wish to play from a menu of diverse roles and provides alternatives for them to consider for each decision to be made. The emphasis in simulation decision-making tends to be on the quality of the decision rather than right or wrong answers, i.e., some decisions are better than others. Simulation software for the classroom should be free of grammatical errors; provide students with the opportunity to respond frequently to stimuli; and be at the students' level of understanding. Teachers need to be knowledgeable about the subject matter, sequence of presentation, and the response students should make to the programs; be good managers of student time devoted to simulation usage; and utilize simulation programs with other instructional materials. Objectives for student achievement should address understandings, skills, and attitudes. Some educators recommend that teachers develop their own simulation programs; however, quality software is becoming more available, and the commitment of time and energy involved in software development are important considerations for teachers. A list of factors involved in the effective use of simulated materials to assist students in achieving higher cognitive level objectives concludes this paper. A sample software evaluation form is included. (RP)

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Simulations and the Curriculum

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IR012907

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Simulations and the Curriculum

Simulated experiences have been utilized for several decades by teachers. Simulations are to develop realistic experiences for students. Through stimulated activities, students experience situations resembling reality, but they are not the real world, in and of themselves. Very low risks are then involved by students in participating in simulated experiences. The traumatic, the unhappy and the sad, as well as the good, are experienced vicariously, not directly.

Teachers, in the past as well as presently, have guided students to dramatize content read from a library book or textbooks. The learner then plays the role of a character in the library book or textbook. Students attempt to feel and experience what characters in the reference books experienced. The attempt by the teacher is to have learners experience reality as much as possible, with actual risks reduced greatly or being at a zero level. Naturally, learners who are able to play the roles of characters in library books and textbooks will experience minimum risk with difficult situations experienced by characters in these reference books. Thus, in degrees, students will internalize involved feelings in role play situations.

With the use of puppetry, students may further simulate real live situations in life. A learner plays the role of a specific character as represented by the puppet. Certainly, selected learners will do a better job of role playing, as compared to others in the classroom. The intent remains in the use of puppets that

students attempt to simulate the real, the life-like, and the concrete.

Simulations and the Computer

Numerous classifications of software are on the market. A brief review will be given of the purpose(s) of each type of software.

A very common goal of software and microcomputer instruction is drill and practice. Drill and practice refers to review of content, previously presented to the learner. Learning opportunities involving drill and practice emphasize students retaining subject matter learned at an earlier time.

A second goal in utilizing software and the microcomputer is tutorial instruction. Tutorials emphasize new subject matter to be acquired by students. Thus, content is presented on the monitor. The learner must respond to a test item, such as a multiple choice type, to reveal comprehension covering the content. If correct, reinforcement will indicate the correctness on the screen. Generally, a second chance is given to respond correctly, if the first response given by the learner was incorrect. Based on his/her response, the student is given feedback.

A third goal in utilizing software and the microcomputer is the playing of games. Valuable learnings may be achieved through these games. Generally, several players can be at one terminal. For each correct response given by a student to an item on the screen, he/she may receive five points. The student receiving the most points wins the game. The stimuli for the diverse responses to be given by

students may come from any academic discipline or curriculum area. Games can be challenging and interesting to students.

A fourth goal in computer technology is the use of simulations. The balance of this manuscript will emphasize the use of simulated materials. With simulated packages, students individually have a choice as to which role to play. The menu will list the diverse roles. After selection, the students plays the chosen roles throughout the program, unless the learner decides to exit from the program. For each decision to be made the student must consider alternatives. A command is typed in by the student, when ready to make a decision, based on information presented on the screen. After the command has been typed on the keyboard to indicate a choice made, the learner receives feedback. Based on the feedback, he/she is ready to respond again to stimuli presented on the screen. The stimuli again presents a problem for the role player to make a choice or decision. The student types into the microcomputer if a,b,c, or d is desired in terms of a decision. The simulation continues with the student making choices or decisions based on subject matter presented on the screen from the simulated package. Decision-making tends to avoid right or wrong answers in simulation. Rather, in degrees, there are better decisions, than others, which are made. Quality in terms of decisions come an a continuum. To be certain, a bad choice or decision can be made. The consequences of the latter kinds of decisions involve, like all decisions, low risks to learners. The bad decision is simulated,but not experienced in reality. Vicarious valuable learnings accrue. Decision-making is a definite part of life. Students need to have

ample practice in the making of choices, based on adequate knowledge. Feedback based on the decision made is necessary. Sequential choices and decisions are made by the student based on subject matter presented on the screen.

In the software package entitled Choice or Chance (copyright 1984 Rand McNally & Company, Chicago, Illinois), the manual lists the following objectives:

> -To develop an understanding of how the geography of an area affected the decisions people made, which then affected recorded history.
> -To develop a sense of sequence in the events relating to history.
> -To make decisions using problem solving skills, similar to those made in history.
> -To creatively "rewrite" the course of history, based on the geographical factors presented at the time the decision was made.
> -To review selected historical events surrounding these three time periods.

Objective number three above is the heart of the stimulated materials. The role player in the simulation makes decisions, using problem solving skills, similar to those made in history. Situations and scenes are made as life-like and real as possible for students. In Choice or Chance, the student plays the role of an early explorer. The environment in the software is as similar, as can be presented using the particular media, as possible to that of the days of early explorers.

Criteria for Simulation Software

Teachers and administrators selecting software emphasizing simulation must go by definite criteria. Criteria must be utilized in all software selected. However, simulation needs to meet additional standards than those stressed in other kinds of software packages.

Certainly, debugging is necessary to take care of the spelling, punctuation, capitalization, usage, and other mechanical errors. Content in software provides a model for students to emulate in terms of the mechanics in writing. Selectors of software must demand that errors in the mechanics of writing do not exist.

Secondly, learners must be able to respond frequently to stimuli in software. Much printed subject matter on the monitor with few chances to respond to questions makes for a lecture situation. Textbooks and library books may present the subject matter in this manner much more effectively than can software content on the monitor. Learners then need to respond frequently to problems/questions in simulated programs.

An adequate number of simulations need to be available in any classroom. Simulated materials must be on the understanding level of students. They need to relate directly to a unit of study being emphasized in the curriculum. The teacher could teach an entire unit on problem solving using simulations. Sequentially, students learn problem solving skills from the different programs involving simulations. Software and nonsoftware programs of study could be used in these units of study. An adequate number of computers need to be available so each student may achieve in an optimal manner.

The classroom teacher, needs to be highly knowledgeable about the subject matter, sequence of presentation, and needed response to be made by students in the software programs. He/she must be on the lookout continuously for new simulations which stimulate and motivate learners.

Software must be catalogued in a manner whereby its retrieval is easy for teachers to utilize in a classroom. Red tape and cumbersome methods of securing software for students need to be eliminated. Easy access is a key concept in utilizing simulations effectively in the curriculum. Software involving simulation must meet the interest, needs, and purposes of involved learners.

The teacher needs to be a good manager of student time devoted to simulation usage. Time on task is important. The effective organization of students to use computer time wisely is important. Wasting time in computer utilization, as well as discipline problems of students, hinders the wise use of time for instruction. When problems and difficulties arise in computer and software use. the teacher must know how to proceed. An unskilled teacher in organizing students for instruction, as well as in using the computer, is a handicap in any instructional program involving the use of simulations.

Simulated programs in software should be utilized with other materials of instruction. The latter types of materials include textbooks, workbooks, worksheets, films, filmstrips, slides, tapes, instructional television, and video discs. Adequate data needs to be available so that the learner may attain optimally using software programs involving simulations.

Printouts of completed results can be important to students. If the microcomputer has a printer, each student might then look at the results to learn from subject matter presented previously. Increased background information is them available to learners. Growth in learning should be sequential and cumulative.

Balance among objectives needs to be achieved by students when using microcomputer terminals. Subject matter containing facts, concepts, and generalizations is inherent in simulation programs. Understandings objectives may then be achieved by students. A second category of objectives-skills-is a major category of ends for students to attain in using simulated programs.
Relevant skills include problem solving, decision-making, hypothesizing, making judgements, evaluating content needed to make the next sequential choice, and working harmoniously with others in committee settings involving the use of simulations. A third category of objectives-attitudes-emphasizes students enjoying, liking, and feeling positive toward the utilization of simulations as an important means of learning.

Wright and Forcier[1] developed the following evaluation form to appraise software quality:

Course Evaluation Form #3

Program name:_____

Indicate all that apply with yes or no:

Drill and Practice_____Tutorial_____

Simulation_____Tool_____

Interaction

_____ 1. Program is personalized

_____

[1]Edward B. Wright and Richard E. Forcier, The Computer: A Tool for the Teacher. Delmont, California: Wadsworth Publishing company, 1985, page 160.

_____ 2. User can stop at any time

_____ 3. User can see score at any time

_____ 4. User can select level of difficulty

_____ 5. User can review instructions

_____ 6. User can review past mistakes

_____ 7. User goes at own speed

_____ 8. Testing occurs periodically during program

_____ 9. Program can select level of difficulty through testing

Content

_____ 1. Appropriate subject matter

_____ 2. Appropriate for grade level suggested

_____ 3. No implied racial or sexual discrimination

_____ 4. Can reteach principles

_____ 5. Meets objectives (teaches what it is supposed to)

_____ 6. Applicable to more than one subject

_____ 7. Presents correct information

_____ 8. Program is interesting

_____ 9. Program is involving

_____10. Program is realistic

_____11. Program is educationally sound

Teacher Developed Simulations

There are selected educators recommending teachers developing their own simulation programs. The classroom teacher is in the best possible position to know what students are ready for in terms of

new learnings. Readiness for a new task must be in evidence for individual pupils to benefit from new content being presented on the screen.

The teacher should also be in the best position to know which learnings students can attain sequentially. If a new step in learning to too complex, the involved student may experience failure. Reinforcement in learning is then not in evidence. A problem that teachers do face, more so than a publishing company of software, is the time and money necessary to debug a program. Thus, a professional programmer can use pilot studies in determining at which step or steps a program is not sequential. In the pilot studies, students may reveal at which point the next step of learning was too complex. This is not to say that commercial companies do quality work in debugging a program. The opportunities to do so, however, are more in existence as compared to a classroom teacher who teaches full time and writes one or more programs on weekends or after school hours. Kemp and Dayton[2] wrote:

> Unlike human beings, computers are very particular about the accuracy of the instructions they receive. A single misplaced letter or symbol can render a computer program useless as an instructional tool. Therefore it is very important that CBI materials be thoroughly tested before they are released for broad use.

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[2]Jerrold E. Kemp and Deane K. Dayton, Planning and Producing Instructional Media. Fifth ed. New York: Harper and Row, Publishers, 1985, page 255.

> Errors such as these are called "bugs" and the process by which they are located and removed is called debugging. This is best accomplished by letting a variety of people try the materials to see what types of problems might occur. Ideally these people should be representative of the learners for whom the materials are designed and should go through the materials under the anticipated circumstances for their use. They should be asked to work through the program several times, trying all of the options, so that each branch can be tested. In addition, they should judge the effectiveness of the instructions and the clarity of the documentation.

Programs written by a teacher can definitely fit in to an ongoing lesson or unit. The contents in the program are then related to objectives emphasized in the curriculum. It will be more difficult to secure from a commercial company software that sequentially harmonizes with present teaching and learning objectives emphasized in the classroom. However, quality software is increasing in number in schools whereby choices of content can be made which definitely relates to what is presently being taught in the curriculum.

Time is an important consideration for any teacher. Teaching is a demanding profession. Much energy goes into quality instruction in any classroom. Energy may not be available to develop programs by instructors. The "adding on" concept to a teachers load might well distract from a teacher's ability and performance in teaching. Commercial companies hire programmers to write, edit, evaluate, and produce course software. Administrators and supervisors in schools need to emphasize the nomothetic (needs of the institution or schools and their goals), as well as the ideographic (personal needs of teachers) dimension. A balance

needs to be emphasized between the objectives of the school and objectives of human beings.

In Conclusion

There are numerous issues involved in the utilization of simulations. Certainly, modern technology is here to stay and will continue to change the quality of simulated materials. Hopefully, the changes will be for the good. Students individually need to achieve as much as possible in the curriculum. Microcomputer instruction may well be a means to guide students to achieve course goals more effectively. The use of simulated materials will assist students to achieve higher cognitive level objectives. What will aid students to achieve and progress continuously?

1. Each learner needs to be successful in learning by experiencing quality sequence in ongoing simulation programs.
2. Reasons or purpose need to be inherent in diverse learning activities involving the utilization of simulated materials.
3. Challenging, interesting experiences need to be in the offing for pupils.
4. Adequate provisions need to be made for slow average, and fast achievers in an atmosphere of respect.
5. Students must understand and attach meaning to what is being learned in each simulation.
6. Learners need to experience balance in the

curriculum. Thus, understandings, skills, and attitudinal goals need to be stressed adequately in the simulation curriculum.

Selected References

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